NEOS: Network Enabled Optimization Services
Jason Sarich, Jorge Moré, and Todd Munson[*]
Argonne National Laboratory

Summary

The NEOS Project is a collaborative effort between Argonne National Laboratory and Northwestern University. The NEOS Guide provides educational material and case studies, while the NEOS Server gives users access to high-quality numerical optimization software through the Internet. A new version of the NEOS Server has been released, implemented entirely in the Python language. It has been redesigned to be more reliable, scalable, portable, and maintainable than earlier releases. An XML-RPC interface to the Server has been added to improve interoperability with other services, as well as a set of Web-based administration tools.

The NEOS Server has been in existence for over ten years and now handles approximately 175,000 submissions per year from the academic, commercial, and government sectors. Figure 1 shows the growth in the number of submissions received by the Server. As the use of NEOS has increased, efforts have been made to improve the usability and maintainability of the Server.
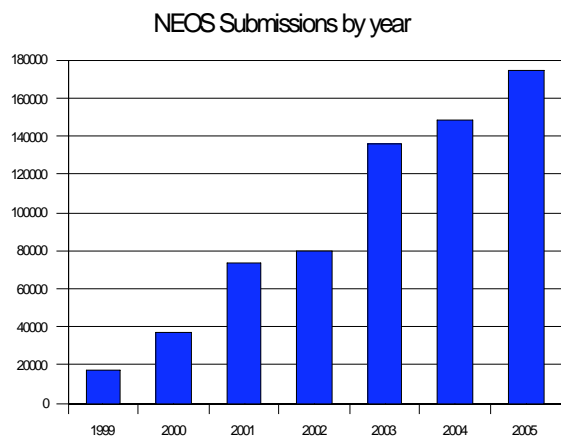

Figure 1: *Number of submissions made to the NEOS Server over the past six years.*

Improved Usability
One new feature of the NEOS Server is the introduction of an XML-RPC (Extensible Markup Language – Remote Procedure Call) interface. This interface gives users much more flexibility in accessing the NEOS Server from their own environments. Previously, the only published ways to access the NEOS Server were through Web forms, e-mail, the NEOS Submission Tool, or the AMPL or GAMS modeling languages by using the Kestrel clients we developed.

Many users, however, have asked about accessing the NEOS Server from other environments, such as from a command line or inside a piece of software. To facilitate this requested accessibility, we have added to the NEOS Server a published API (Application Programming Interface), callable through the XML-RPC protocol. In particular, users can now easily write their own clients that invoke the Server in a variety of programming languages by using

XML-RPC. Figure 2 shows that since the introduction of the XML-RPC interface in August 2006, almost one-fourth of all NEOS submissions used this interface.
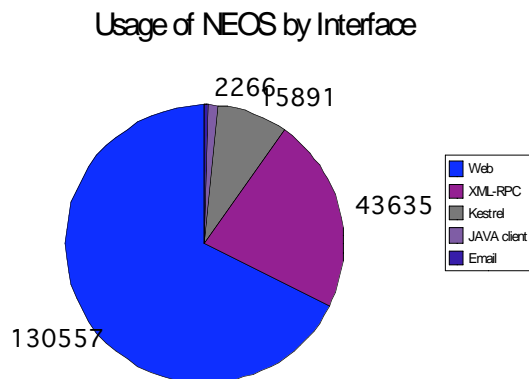
Usage of NEOS by Interface

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- Web
- XML-RPC
- Kestrel
- JAVA client
- Email

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Figure 2. Number of submissions made to the NEOS Server since the XML-RPC interface was introduced.

Improved Maintainability
Included in the update to the NEOS Server was the introduction of a MySQL database to store information on NEOS submissions. MySQL lets the NEOS administrators easily monitor usage, quickly compile statistics, and flexibly mine the submissions based on different criteria. Further, it enables reliable tracking of available solvers, running processes, and jobs waiting to be scheduled.

Taking advantage of the MySQL database, the NEOS Server now provides universal access to simple usage queries such as the number of submissions sent to NEOS for a particular solver on NEOS during a given time interval.

Streamlining Administration Tasks
Another feature recently introduced in NEOS is a Web-based administration toolkit. When completed, this toolkit will allow the NEOS maintainers to perform common NEOS administration tasks such as checking the connections of all the machines in the network, reading process logs, running tests of various solvers, and restarting any necessary daemon processes While all these tasks are currently possible by logging on to the NEOS Server machine and executing scripts from the command line, this toolkit will help to streamline the process. These features reduce the burden on the administrators to ensure that everything is configured correctly and running smoothly.

For further information on this subject contact:
Todd Munson
Argonne National Laboratory
Mathematics and Computer Science Division
tmunson@mcs.anl.gov
630-252-4279

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[*] Mathematics and Computer Science Division, (630) 252-4279, tmunson@mcs.anl.gov